12-08-99

Practitioner's Docket No. 297-009078-US(PAR) **PATENT**

A

12/07/99 jg654 U.S. PTO

Jc490 U.S. PTO 09/456263 12/07/99

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: *"All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. § 601, 7th ed.*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Jussi RUUTU, Jian MA

WARNING: *37 C.F.R. § 1.41(a)(1) points out:*

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): A METHOD FOR OPTIMIZING OF DATA TRANSMISSION

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date December 7, 1999, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL067144718US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Elaine Mian

(type or print name of person mailing paper)

Elaine Mian

Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

1. Type of Application

This new application is for a(n)

(check one applicable item below)

☒ Original (nonprovisional)

☐ Design

☐ Plant

WARNING: *Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

WARNING: *Do not use this transmittal for the filing of a provisional application.*

NOTE: If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

☐ Divisional.

☐ Continuation.

☐ Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

WARNING: *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

Doc Code: Appln-Trans

WARNING: When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

13 Pages of specification

2 Pages of claims

5 Sheets of drawing

WARNING: DO NOT submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c)).

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).

☐ formal

☐ informal

B. Other Papers Enclosed

6 Pages of declaration and power of attorney

1 Pages of abstract

____ Other

4. Additional papers enclosed

☐ Amendment to claims

☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☒ Information Disclosure Statement (37 C.F.R. § 1.98)

☒ Form PTO–1449 (PTO/SB/08A and 08B)

☒ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative

☐ Special Comments

☐ Other

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

☒ Enclosed

Executed by

(check **all** *applicable boxes)*

☒ inventor(s).

☐ legal representative of inventor(s). 37 C.F.R. §§ 1.42 or 1.43.

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. *See* item 13 below for fee.

☐ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

☐ Showing that the filing is authorized. *(not required unless called into question. 37 C.F.R. § 1.41(d))*

PTO/SB/05 (4-01)

6. Inventorship Statement

WARNING: *If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.*

The inventorship for all the claims in this application are:

☐ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

- ☐ is submitted.
- ☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of $130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

☒ English

☐ Non-English

- ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

8. Assignment

☒ An assignment of the invention to Nokia Mobile Phones Ltd.

- ☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.
- ☐ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: *A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.*

PTO/SB/05 (4-98)

9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Finland	982651	8 December 1998
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☒ is (are) attached.

☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. § 1.16)

A. ☒ Regular application

CLAIMS AS FILED					
Number filed		Number Extra		Rate	Basic Fee 37 C.F.R. § 1.16(a) $760.00
Total Claims (37 C.F.R. § 1.16(c))	11 − 20 =	0	×	$ 18.00	0
Independent Claims (37 C.F.R. § 1.16(b))	1 − 3 =	0	×	$ 78.00	0
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))			+	$260.00	

☐ Amendment cancelling extra claims is enclosed.

☐ Amendment deleting multiple-dependencies is enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation $ 760.00

B. ☐ Design application ($310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation $_____

C. ☐ Plant application ($480.00—37 C.F.R. § 1.16(g))

Filing fee calculation $_____

11. Small Entity Statement(s)

☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

WARNING: "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

*WARNING: "Small entity status must not be established when the person or persons signing the . . . statement can **unequivocally** make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).*

(complete the following, if applicable)

☐ Status as a small entity was claimed in prior application

_____ / _____, filed on _____, from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A, B** or **C** above)

$_____

NOTE: Any excess of the full fee paid will be refunded if small entitiy status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☐ Not Enclosed

☐ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Filing fee $ 760.00

☒ Recording assignment
($40.00; 37 C.F.R. § 1.21(h))
(See attached "COVER SHEET FOR ASSIGNMENT ACCOMPANYING NEW APPLICATION".) $ 40.00

☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached
($130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) $ _____

☐ For processing an application with a specification in a non-English language
($130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) $ _____

☐ Processing and retention fee
($130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) $ _____

☐ Fee for international-type search report
($40.00; 37 C.F.R. § 1.21(e)) $ _____

NOTE: 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed $ 800.00

14. Method of Payment of Fees

☒ Check in the amount of $ 800.00

☐ Charge Account No. _____ in the amount of $_____.
A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: *If no fees are to be paid on filing, the following items should not be completed.*

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 16-1350 :

☒ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

☒ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

☒ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

☒ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

☐ 37 C.F.R. § 1.17 (application processing fees)

NOTE: ". . .A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . " From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

PTO/SB/05 (4-97) Approved for use through 09/30/98. OMB 0651-0032

16. Instructions as to Overpayment

NOTE: ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ Credit Account No. 16-1350

☐ Refund

SEND ALL CORRESPONDENCE TO:

Reg. No. 24,622

Tel. No. (203) 259-1800

Customer No.

SIGNATURE OF PRACTITIONER

Clarence A. Green

(type or print name of attorney)

PERMAN & GREEN, LLP

P.O. Address

425 Post Road, Fairfield, Connecticut 06430

09656265.030704

☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☒ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

☒ This transmittal ends with this page.

Express mail #
EL067147185US

A method for optimizing of data transmission

TECHNICAL FIELD OF THE INVENTION

The invention is related to optimization of data transmission in TCP/IP networks, particularly to problems created by transmission of encrypted traffic.

BACKGROUND OF THE INVENTION

TCP/IP network technology is presently in widespread use, the Internet being a manifest example of a network realized using the Transmission Control Protocol (TCP) and Internet Protocol (IP). The IP protocol provides a basic packet data transfer mechanism without error checking, acknowledgments or flow control. The TCP protocol provides a reliable data transmission mechanism with transmission error correction, flow control and many other functions. The IP protocol is defined in the specification RFC 791, and the TCP protocol is defined in the specification RFC 793. An introduction to these protocols is presented in RFC 1180.

The IP protocol version 4 (IPv4) defined by RFC 791 has a limited address space due to the source and destination addresses being only 32 bit long. The current expansion of the Internet and the development of technology, the address space is filling out quickly. Therefore, version 6 of the IP protocol (IPv6) has been designed. The addresses in IPv6 are 128 bits long, allowing a vastly larger address space. There are also further motivations behind IPv6 and other differences between IPv4 and IPv6. The IPv6 protocol is described in the specification RFC 1883. Some details of the TCP and IP protocols relevant to the present invention are described in the following with reference to figures 1, 2, and 3.

In the IP protocol, data is transmitted in so called datagrams, which contain a header part and a payload data part. Figure 1 shows the structure of an IPv4 header. In the following only some of the header fields are described. A detailed description can be found from the above mentioned RFC 791. The first field, the four bits long version field, contains the version number which for IPv4 is 4. The total length field gives the length of the datagram, header and data part combined, as the number of octets i.e. groups of 8 bits. The source and destination addresses specify the IP address of the sender and the intended receiver. Various options can be specified in the options field, which may vary in length from datagram to datagram. The number of different options specified in the options field may as well vary. The options field

is not mandatory, i.e. in some datagrams there may be no options field at all. The padding field is used to ensure that the header ends on a 32 bit boundary. The padding field is filled with zeroes. After the padding field comes the payload data part, whose length can be found out by the recipient of the datagram by subtracting the length of the header from the value of the total length field.

Figure 2 illustrates the structure of an IPv6 header. The IPv6 header is simpler than the IPv4 header, allowing faster processing of datagrams in transmission nodes. The first four bits of the header comprise the version field, which for IPv6 contains the value 6. The payload length field specifies the length of the data part in octets. The next header field specifies the type of any header following this header. The next header may for example be a TCP header in case the IP datagram carries a TCP packet, or an extension header. The source and destination address fields, each consisting of four 32-bit words giving a total of 128 bits for each address, specify the sender and the intended receiver of the datagram. Instead of an options field, inclusion of optional data in the header is provided in IPv6 by so called extension headers. Various extension header types are described in RFC 1883. There may be zero, one or more than one extension headers in an IPv6 datagram. Each IPv6 datagram comprises extension headers for only those facilities that the datagram uses. The extension headers are placed after one another after the main header in a chain-like fashion. Each extension header comprises a Next header field. The next header field of the main header specifies the type of the first extension header, and the next header field of each extension header specifies the type of the following extension header. A special value in the next header field specifies that no more headers follow this specific header.

Figure 3 illustrates the structure of a TCP header. The most relevant fields are described in the following. The other fields in a TCP header are described in the above mentioned RFC 793.

The TCP header indicates a destination port number at the receiving host, to which the packet is directed. The TCP protocol makes it possible for many different services to exist at a single IP address, by introducing the concept of a port. A program can listen to a specific port, and receive any data sent to that port. Conversely, a program can send a packet to a specific port on a distant host. Therefore, the destination port number defines which service or program will receive the packet at the host specified by the IP address. Similarly, the source port number indicates, which service or program sent the TCP packet.

The TCP data octets sent by a host are numbered sequentially. The number of the first octet of data in the data part is included in the TCP header in the sequence number field. Based on this number, the receiving second host can check whether TCP packets have arrived through the transmission network in the right order, and if any packets are missing. The second host conventionally sends an acknowledgment to the first host for each received packet. The acknowledgment message is included in a normal TCP packet sent by the second host to the first host. The acknowledgment is indicated by the ACK flag and the acknowledgment number. The acknowledgment number is the sequence number of the next octet, which the sender of the packet is expecting to receive from the other end. If there is no other data to be sent from the second host to the first host, the payload data part can be empty in such an acknowledgment packet. If the second host is transmitting data to the first host, the acknowledgment can be indicated in the header of a packet containing some payload data. Therefore, the ACK messages do not always add transmission load. If a host does not receive an acknowledgment for some data within a timeout period, the data is retransmitted.

The data part follows the TCP header. The length of the data part is carried by the IP protocol, therefore there is no corresponding field in the TCP header.

TCP is one of the few transport protocols that has its congestion control mechanisms. The key congestion control mechanism in TCP is the "slow start" mechanism, which functions in the following way. According to the TCP protocol, the sender starts sending data at a very slow rate, and monitors acknowledgment ACK messages from the receiving end to see, if any data is lost. If no data is lost i.e. sender always receives an ACK, the TCP sending host increases the data rate. The sending increases the data rate, until data is lost, which the sender can observe as missing ACK messages. The data loss typically results from the behavior of intermediate hosts: if an intermediate node cannot forward a data packet due to congestion, the node simply discards the packet. The sending host then retransmits the packet at a later time, since no ACK message was received from the receiving host due to disappearance of the packet. When the sending host notices that ACK messages have not been received for a data packet, the sending host decreases the data rate, until no more data is lost. When each transmitted packet again results in an ACK message, the sending host starts increasing the data rate again. Consequently, an oscillating behavior results, in which the TCP transmission oscillates with a

period of 1 to 2 seconds, and data is lost on one part of the cycle and the capacity of the network is not used in an optimum way on the other part of the cycle.

Recently, a new mechanism for controlling congestion situations in a TCP/IP network has been presented, for example, in an article entitled "A Simple Fast Flow Control for TCP/IP over Satellite ATM Network" by Jian Ma, published in the proceedings of the wmATM '98 conference, 6-10 April 1998, Hangzhou. This mechanism, called Fast TCP or FTCP, alleviates the problems of oscillation. In this mechanism, when an intermediate node detects a congestion situation, it delays the ACK messages returning from the receiving end. As a result of ACK messages being delayed, the sending host delays the sending of further data packets, which reduces congestion. In this way, congestion can be controlled without loss of data.

Fast TCP is only one example of various control mechanisms which rely on identification of the contents of IP packets, i.e. identification of TCP messages. Another example of such a mechanism is a method described by R. Satyavolu et al in ATM Forum Document 98-0152 "Explicit rate control of TCP applications", which utilizes the window value carried in the TCP header for rate control of TCP traffic. The main idea of this method is to modify the contents of the window size field in the TCP header. This method does not work if a network element is not able to access the encrypted IP payload, identify the original window size, read it and communicate the modified value to the TCP source with the IP datagram. Other examples concerning control of TCP traffic have also been proposed by MIT and End-to-End Research Group of the Internet Research Task Force respectively in "An Acknowledgment Bucket Scheme for Regulating TCP Flow over ATM", in Globecom '97, Nov. 1997, and "ACK spacing for high delay-bandwith paths with insufficient buffering", Internet Draft, July 1997. The ATM Forum document ATMF97-758r1 entitled "TCP flow control with ACR information", December 1997, describes an example of using TCP ACKs as a flow control interworking media.

Encryption of IP traffic is often desirable for security reasons. In encrypted IP traffic, all payload data of the IP datagrams is encrypted. Since the TCP header and data are carried as payload data in IP datagrams, all TCP header information is encrypted as well along with TCP data.

However, IP encryption creates a problem, when any mechanisms relying of identification of TCP messages are used. Any mechanisms which rely on the

recognition and possible processing of TCP ACK messages require that at least some of the intermediate nodes participating in the mechanisms are able to read the contents of the IP packets. If the IP traffic is encrypted, the intermediate nodes cannot identify the TCP messages. Therefore, the intermediate nodes are unable to perform the control mechanisms based on TCP ACK messages.

SUMMARY OF THE INVENTION

An object of the invention is to realize a method for transmission of encrypted IP traffic, which allows control of the data transmission based on information carried in headers of TCP packets. A further object of the invention is to realize a method for transmission of encrypted IP traffic, which allows control and/or processing of TCP ACK messages.

The objects are reached by inserting at least an indication of the presence of the information on which the control is based into the header of the IP datagram carrying the TCP packet. The insertion of said at least an indication may comprise placing of at least a copy of the information on which the control is based into the header of the IP datagram.

The method according to the invention is characterized by that, which is specified in the characterizing part of the independent method claim. The dependent claims describe further advantageous embodiments of the invention.

According to the invention, at least an indication of a TCP ACK or other TCP information used as a basis of processing is placed in the IP header of an IP datagram, if such information is carried by the IP datagram. The indication may simply be a flag indicating the presence of a TCP acknowledgment. The indication may also contain the acknowledgment number or other TCP header information, which allows processing of the encrypted traffic based on the acknowledgment number or other TCP header information. In IPv4 datagrams, the indication may be inserted as an extra option field. In IPv6 datagrams, the indication may be inserted as an extension header.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following with reference to the accompanying drawings, of which

Figure 1 illustrates the structure of an IPv4 header,

Figure 2 illustrates the structure of an IPv6 header,

Figure 3 illustrates the structure of a TCP header,

Figure 4 illustrates one advantageous embodiment of the invention,

Figure 5 illustrates the structure of the option code octet of an option field in an IPv4 header,

Figure 6 illustrates the structure of an IPv6 extension header according to an embodiment of the invention, and

Figure 7 illustrates signalling according to an advantageous embodiment of the invention.

Same reference numerals are used for similar entities in the figures.

DETAILED DESCRIPTION

In the following, four groups of embodiments of the invention are described in further detail.

FIRST GROUP OF EMBODIMENTS

In the first group of embodiments, the source originating the TCP traffic being acknowledged performs the decryption of the TCP traffic. In order to allow an intermediate network element to perform ACK based processing, information about ACK messages contained in the received packets are signalled to any such intermediate network elements performing ACK based processing. Encrypted IP packets are decrypted at the TCP source host, and before conventional TCP processing, the ACK information is routed to the entity performing the ACK-based control or processing. There may be one or more such entities. When there are more than one such entities, the ACK information is sent to all of these entities. The entity may be an intermediate network element, or a control member within the TCP source host.

Figure 4 illustrates the configuration in an advantageous embodiment of the invention, which embodiment is an example of the first group of embodiments. Figure 4 illustrates a source network element 10, an intermediate network element 20 and a destination network element 30 as well as communication links 5 between the elements. Figure 4 further illustrates the protocol stacks at each element, in which stack the physical layer is lowest, IP layer above the physical layer and the TCP layer above the IP layer. According to this embodiment, a further communication channel 6 is set up between the source network element 10 and the intermediate network element 20, which communication channel is used to transmit information about ACK messages contained in the received packets. This configuration allows the intermediate network element to process the traffic, even though the IP traffic is encrypted.

In one advantageous embodiment of the invention, the ACK messages are stored in a queue at the source host, and information about the messages is signalled to a ACK processing network element. The source host waits for commands from the network element before further processing of the queued ACK messages.

In another advantageous embodiment of the invention, any ACK message information found in decrypted packets is signalled to a network element and subsequently discarded by the source host. In this embodiment, the network element inserts the ACK messages in the traffic for example unencrypted. When the source host receives unencrypted ACK messages, the source host performs normal ACK processing. In this embodiment, the source host may comprise an acknowledgment message routing unit, which routes the ACK messages found in encrypted packets to any intermediate network elements performing ACK based processing, and allows ACK messages found in unencrypted packets to be processed in the normal way by the source host.

In a further advantageous embodiment of the invention, the ACK-based processing is performed in the source host, which decrypts the encrypted IP traffic. In this embodiment, a network element performing ACK processing for unencrypted traffic, signals any further information needed for the ACK processing to the source host in case of encrypted traffic, whereby the source host is able to perform similar processing. Said further information may comprise for example information about the congestion situation of the network as observed by the network element.

SECOND GROUP OF EMBODIMENTS

The problems associated with ACK processing of encrypted IP traffic can also be solved by providing network elements performing the processing with the capability to decrypt IP packets. In such an embodiment, the network element is able to decrypt the IP packets and perform the network control functions, such as FTCP processing, in the normal way. Such an embodiment has for example such an advantage that no changes are needed in the programs performing TCP and IP processing and IP encryption and decryption at either source or destination host. The actual realization of such an embodiment is naturally dependent on the encryption system used for encryption of the IP datagrams. For example, the entity performing the encryption may transmit to the network element the decryption key needed for the decryption of the IP datagrams. As an another example, the network element may be provided with decryption keys for a number of TCP connections, which connections are processed by the network element.

THIRD GROUP OF EMBODIMENTS

The problems associated with ACK processing of encrypted IP traffic can also be solved by using plain, i.e. unencrypted ACK messages. In such an embodiment, the entity performing the encryption of IP datagram payload data leaves such datagrams unencrypted, which datagrams contain a TCP ACK message. Other datagrams are encrypted in the normal way. This method allows processing of ACK messages by intermediate network elements to proceed in the normal way, since the ACK messages are not encrypted.

In this embodiment, the TCP destination host is required to produce both encrypted and plain IP packets belonging to the same TCP connection, and the TCP source host is required to be able to receive both encrypted and plain IP packets.

Preferably, in this embodiment, TCP ACK messages are sent in otherwise empty TCP packets, i.e. no data is sent in those packets containing an ACK message, in order to avoid sending payload data unencrypted.

This embodiment has such an advantage, that it does not require additional signalling channels, and that more than one network elements can observe the ACK messages without special arrangements. Therefore, this embodiment allows easy

changes in the network topology, such as increasing the number of intermediate network elements.

FOURTH GROUP OF EMBODIMENTS

According to a further embodiment of the invention, an indication that a TCP ACK message is contained in an encrypted IP datagram is placed in the header of the IP datagram. This allows the intermediate network elements to perform processing based on the ACK messages despite the fact that the ACK messages themselves are encrypted. An indication of an ACK message without the ACK number is sufficient to such processing, which does not need the ACK number. In another embodiment of the invention, also the ACK number is placed in the IP header. This allows functioning of such mechanisms, which need the ACK number in some way. For example, such mechanisms may then modify the ACK number.

With IPv4 datagrams, the indication of an ACK message may be incorporated in the IP header as an extra option field. The ACK number may as well be incorporated in the IP header as an extra option field. The indication of an ACK message and the ACK number may be contained in the same option field, or they may be placed in separate option fields. The invention does not limit the encoding of the indication of an ACK message nor the encoding of the ACK number in the extra option field or fields in any way. A person skilled in the art can devise many different ways of encoding the indication of ACK and the ACK number in an extra option field of an IPv4 header.

The ACK message or an indication of an ACK message can be encoded in many ways in an IPv4 header. For example, an indication of an ACK message can be included in the Type of Service (TOS) field. The bits 6 and 7 of the TOS field are unused according to current IPv4 specifications, whereby one of these two bits could for example be used to indicate an ACK message. For example, in one embodiment of the invention, bit 6 of the TOS field of an IP datagram is set to 1, if the IP datagram comprises a TCP ACK message and to 0, if the IP datagram does not comprise a TCP ACK message.

In another advantageous embodiment of the invention, the encoding of an ACK message is realized by copying at least a part of the TCP header into an option field of an IPv4 datagram. Figure 5 illustrates the structure of an option field. An option field contains either an option type octet only, or an option type octet, an option

length octet and data. The first bit of the option type octet i.e. bit number 0 indicates, whether the option field should be copied only to the first fragment of an IP datagram in such a case, when the IP datagram is fragmented at some point during its transmission. If the first bit is set to 0, only the first fragment shall contain the option field. If the first bit is set to 1, the option field is copied to all fragments. Bits 1 and 2, i.e. Option Class bits describe the class of the option. In this example of an embodiment, these bits can be set to 0, in which case the option class bits indicate that the option class is "control", i.e. contents of the field are associated with datagram or network control. The remaining bits of the Option Code octet, i.e. the Option Number field indicates the use of the option field. For this embodiment of the invention, one of the currently unused option numbers should be defined to indicate, that the option field contains at least a part of the TCP header carried in the IP datagram. For example, option number 15 could be defined to indicate this. The meaning of the various values of the Option Class bits and the Option Number bits are defined in the previously mentioned specification RFC 791. The option length octet indicates the length of the whole option field in octets. The data part of the option field contains the actual data of the option field. Preferably, in this embodiment the data part comprises at least the TCP acknowledgement number. The data part may also comprise a whole TCP header.

In an advantageous embodiment of the invention, the existence of an option field containing a TCP header is used as an indication of a TCP ACK or other TCP information.

In an advantageous embodiment of the invention, an indication of an ACK message may be incorporated in an IPv6 datagram as an extension header. The ACK number may as well be incorporated as an extension header, and the indication and the ACK number may be incorporated in the same extension header or as separate extension headers. According to this embodiment of the invention, a new extension header type needs to be defined, i.e. a type specifying that the extension header contains at least a part of a TCP header. In the following, such an extension header is called the TCP extension header.

The TCP extension header can be inserted for example before the Authentication and Encapsulation security payload (ESP) extension headers in an IPv6 datagram.

Figure 6 illustrates an example of the structure of a TCP extension header according to an advantageous embodiment of the invention. In this embodiment, the TCP

extension header contains a Next header field specifying the type of the next header, a Length field specifying the length of the extension header in 8-octet units, the TCP header or at least a part of it, and possibly padding to fill up any remaining space until the length of the extension header is a multiple of 8-octet units as required by RFC 1883. The padding may be realized for example in the way described in section 4.2 of RFC 1883, i.e. by using a single octet of zeroes when only one octet of padding is needed, and by using a single octet of ones, an octet specifying padding length minus two, and N-2 octets of zeroes, when N octets of padding are needed.

Preferably, the entity which performs the encryption of IP datagrams performs the incorporation of the indication of an ACK message in the IP header. The entity performing the incorporation is preferably the TCP destination host, which creates the ACK messages.

However, the invention is not limited to incorporation of an indication of an ACK message in the TCP destination host. For example, the TCP destination host encrypting the IP datagrams may communicate information to a further processing entity, the information indicating which IP datagrams contain an ACK message, and the associated ACK numbers. The further processing entity may then add an indication of an ACK message and possibly also the ACK number to those encrypted IP datagrams, which are pointed out by the TCP destination host as containing an ACK message. Therefore, the process of incorporation of an indication of an ACK message does not need to be performed by the same entity performing the IP encryption.

Incorporation of an indication of an ACK message into the IP header has for example such an advantage, that the TCP source host programs performing the IP decryption and TCP processing do not necessarily need to be changed. The source host can simply ignore the indication of the ACK message. In such embodiments of the invention, where the ACK number is also incorporated in the IP header and various processing mechanisms in the intermediate nodes may modify the ACK number, conventional TCP source host programs do need to be modified to the degree, that the programs use the modified ACK number from the IP header and not the unchanged ACK number from the decrypted TCP packet.

Incorporation of an indication of an ACK message into the IP header has for example also such an advantage, that no TCP payload data needs to be sent without encryption, even if a TCP packet contains both an ACK message and payload data.

Figure 7 shows one example of signalling according to one embodiment belonging to the fourth group of embodiments. Figure 7 shows signalling between a source host 10, a network element 20 and a destination host 30. First, the source host 10 sends 100 a packet to the network element 20, which forwards 110 the packet to the destination host 30. The destination host then encrypts a datagram for transmission back to the source host. In this case, the TCP packet in the datagram contains an acknowledgment, wherefore the destination host inserts 115 an indication of the ACK message in the header of the encrypted IP packet. After preparation of the packet with the acknowledgment, the destination host sends 120 the packet to the network element 20. The network element observes from the IP header that the packet contains an ACK message. In this example, the network is congested at this time, wherefore the network element delays 130 the datagram containing the ACK. When the congestion has eased enough, the network element forwards 140 the datagram to the source host. Figure 7 shows also a further example of signalling in case of no congestion. The source host 10 sends 150 a packet to the network element 20, which forwards 160 the packet to the destination host 30. The destination host then encrypts a datagram for transmission back to the source host. In this case, the TCP packet in the datagram contains an acknowledgment, wherefore the destination host inserts 165 an indication of the ACK message in the header of the encrypted IP packet. After preparation of the packet with the acknowledgment, the destination host sends 170 the packet to the network element 20. In this case, the network is not congested, whereby the network element simply forwards 180 the packet to the source host. The detection of congestion may be performed for example on the basis of packet delays, delays of acknowledgment messages or by any other method known to a person skilled in the art.

In this specification, the term encrypted IP datagram refers to an IP datagram, whose data payload is encrypted at least in part.

The present invention can advantageously be used in connection with previously described fast TCP mechanism. However, the invention is not limited to such an embodiment. The invention can advantageously also be used in connection with other mechanisms, which process TCP traffic based on TCP header information, such as window size or acknowledgment messages. Therefore, the previous examples of ACK processing do not limit the invention in any way. In various embodiments of the invention, similar processing can be based on for example the window size value instead of the ACK number.

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In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

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Claims

1. Method for processing IP traffic based on information within TCP headers carried in IP datagrams, in which traffic at least some of the IP datagrams are encrypted, **characterized** in that
if an IP datagram to be encrypted contains TCP header information used as a basis for the processing, at least an indication of the information on which the processing is based is placed into the header of said datagram.

2. A method according to claim 1, **characterized** in that
if an IP datagram to be encrypted contains a TCP acknowledgment, an indication of the acknowledgment is placed into the header of said datagram.

3. A method according to claim 1, **characterized** in that
said placing of at least an indication into the header of said datagram comprises placing a copy of at least the information on which the processing is based into the header of said datagram.

4. A method according to claim 3, **characterized** in that
said placing of at least an indication into the header of said datagram comprises placing of all information of a TCP header into the header of said datagram.

5. A method according to claim 3, **characterized** in that
a copy of a TCP acknowledgment number is placed into the header of said datagram.

6. A method according to claim 3, **characterized** in that
a copy of the contents of the window size field of a TCP header is placed into the header of said datagram.

7. A method according to claim 1, **characterized** in that
if said datagram is an IPv4 datagram, said at least an indication is placed in an options field of said datagram.

8. A method according to claim 1, **characterized** in that
if said datagram is an IPv6 datagram, said at least an indication is placed in an extension header in said datagram.

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9. A method according to claim 3, in which method
- a source network element generates IP datagrams,
- an intermediate network element forwards the IP datagrams to a destination network element, and
- the destination network element receives the IP datagrams,
characterized in that
the intermediate network element modifies said copy of the information on which the processing is based.

10. A method according to claim 9, **characterized** in that
said destination network element uses said modified copy of the information instead of the encrypted version of the information carried as the payload of the IP datagram.

11. A method according to claim 1, being used in congestion control in a TCP/IP network, **characterized** in that
the method comprises the step of delaying the transmission of an encrypted IP datagram by a network element, if said encrypted IP datagram comprises an indication of a TCP acknowledgment and if said network element detects congestion in the network.

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ABSTRACT

The invention is related to optimization of data transmission in TCP/IP networks, particularly to problems created by transmission of encrypted traffic. According to the invention, an indication of a TCP ACK being carried in the encrypted payload of a IP datagram is added in the IP header of the datagram. The indication may simply be a flag indicating the presence of a TCP acknowledgment. The indication may also contain the acknowledgment number, which allows processing of the encrypted traffic based on the acknowledgment number. In IPv4 datagrams, the indication may be inserted as an extra option field. In IPv6 datagrams, the indication may be inserted as an extension header.

Figure 7

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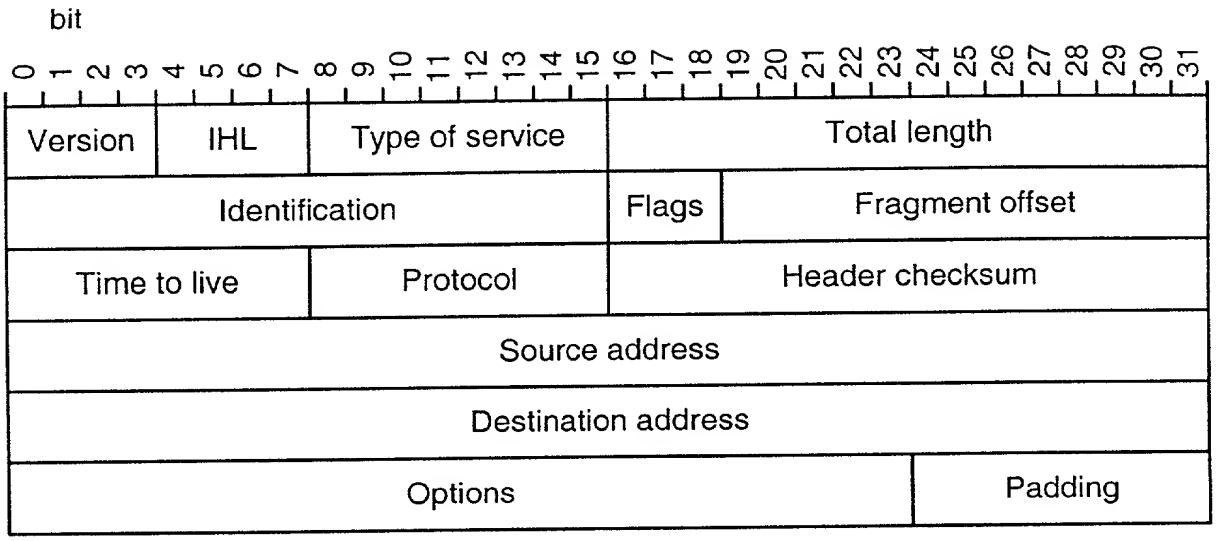

Fig. 1
PRIOR ART

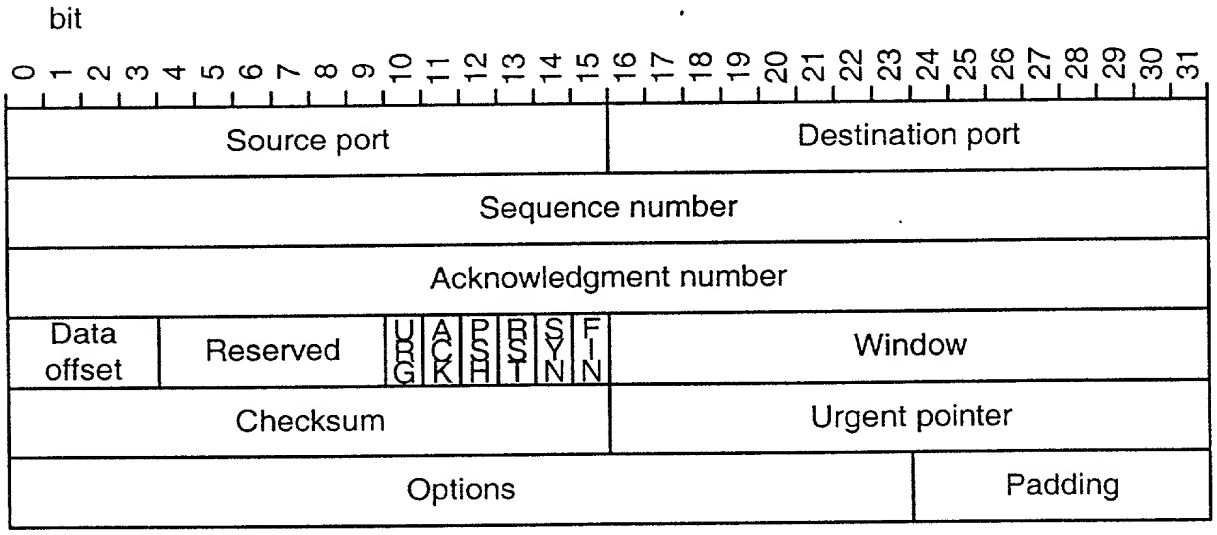

Fig. 3
PRIOR ART

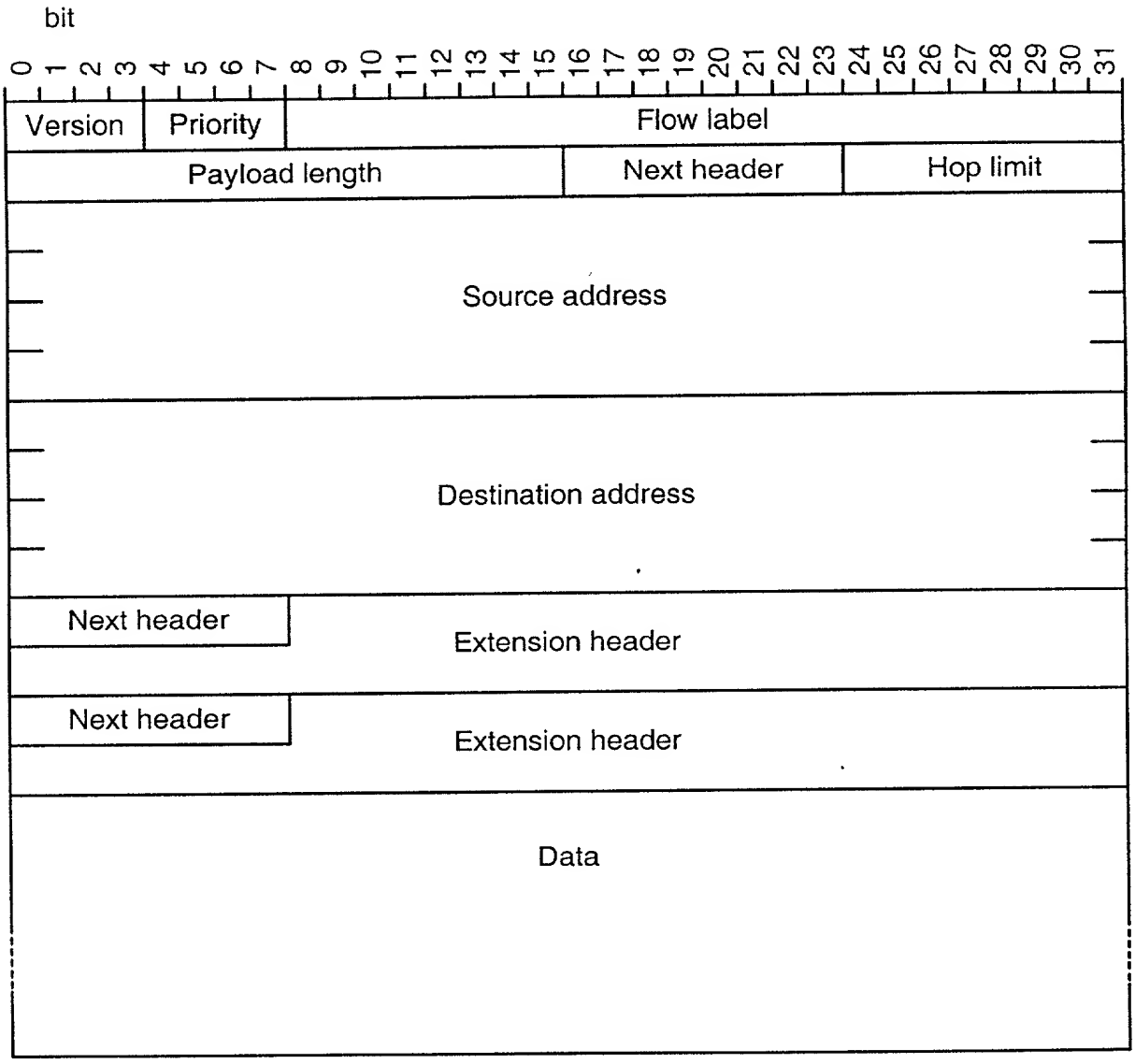

Fig. 2
PRIOR ART

EP 0 952 696 A2

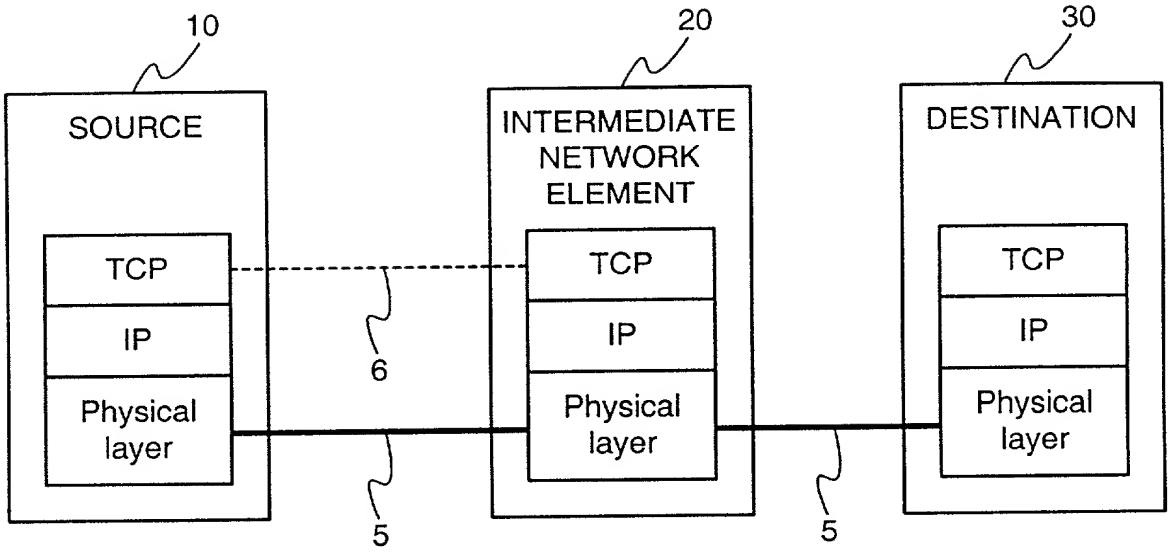
10
20
30
SOURCE
INTERMEDIATE NETWORK ELEMENT
DESTINATION
TCP
IP
Physical layer
TCP
IP
Physical layer
TCP
IP
Physical layer
6
5
5

Fig. 4

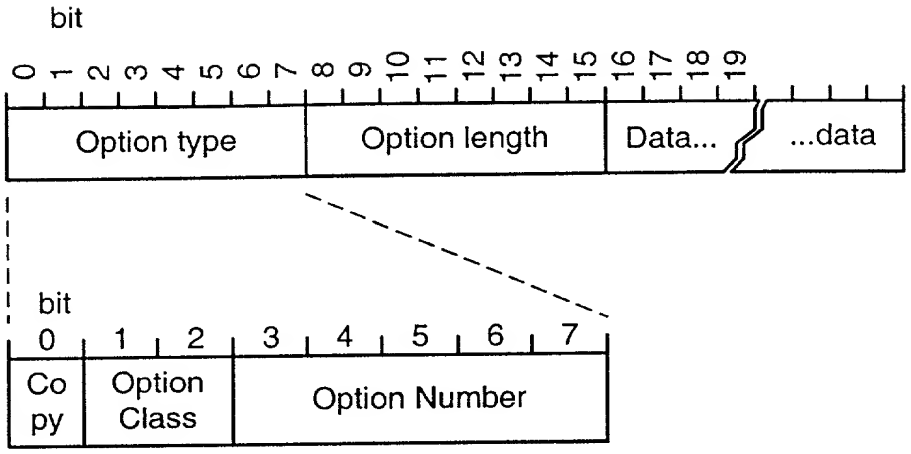

Fig. 5
PRIOR ART

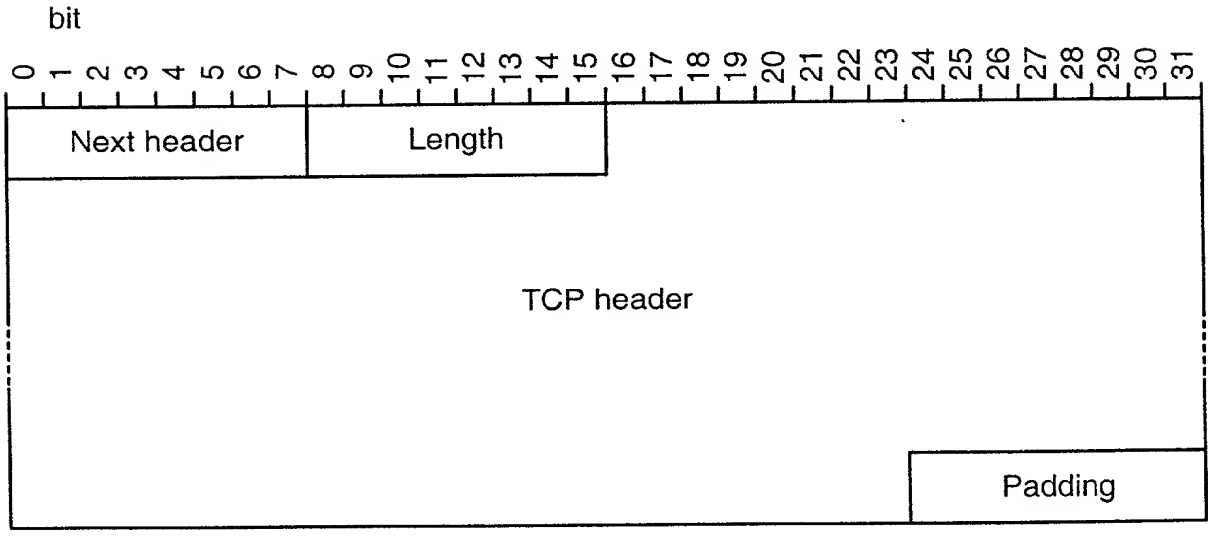

Fig. 6

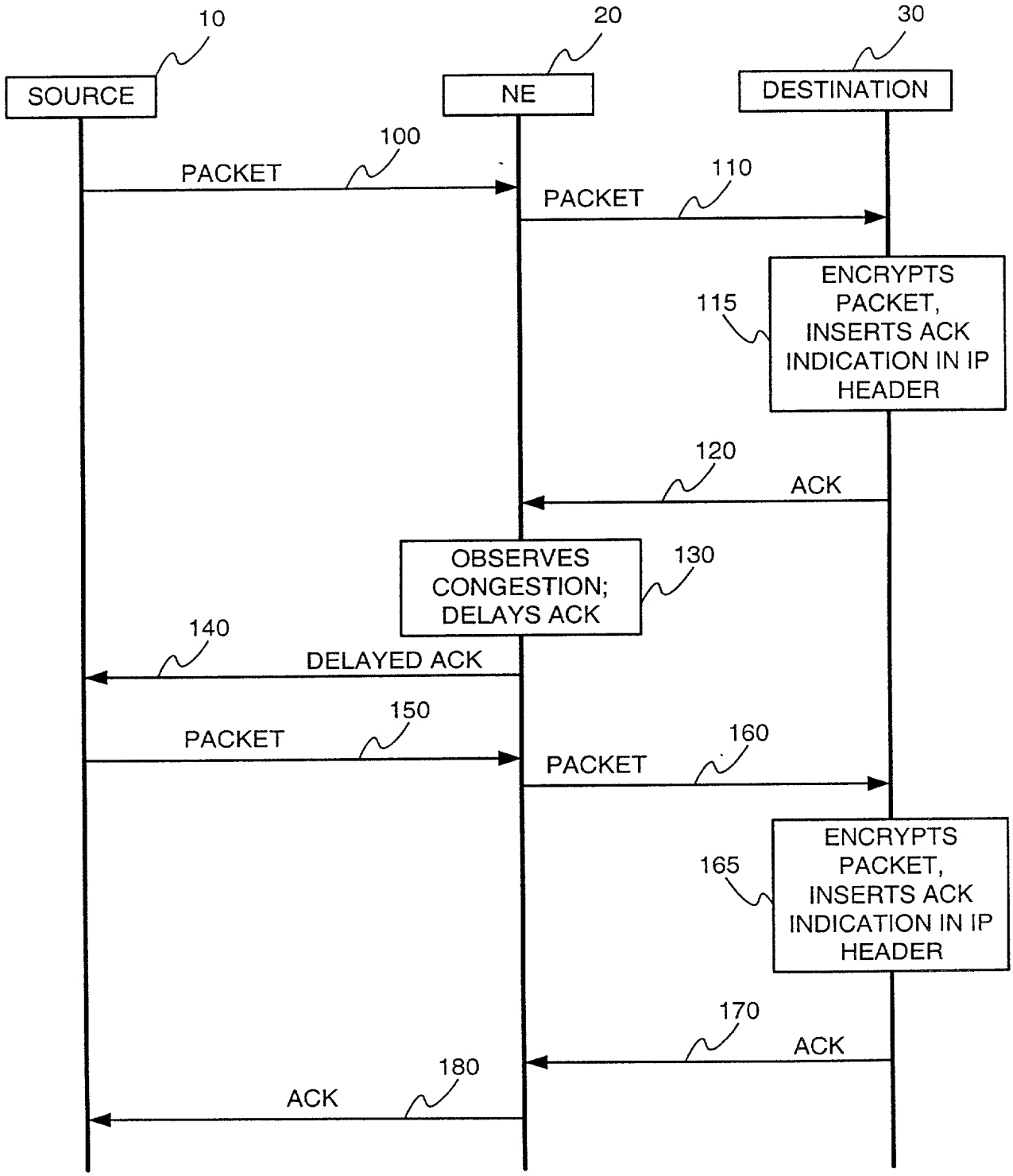
10
SOURCE
20
NE
30
DESTINATION
100
PACKET
110
PACKET
ENCRYPTS PACKET, INSERTS ACK INDICATION IN IP HEADER
115
120
ACK
OBSERVES CONGESTION; DELAYS ACK
130
140
DELAYED ACK
150
PACKET
160
PACKET
ENCRYPTS PACKET, INSERTS ACK INDICATION IN IP HEADER
165
170
ACK
180
ACK

Fig. 7

Attorney's Docket No._____ PATENT

COMBINED DECLARATION AND POWER OF ATTORNEY (ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type:

(check one applicable item below)

X original.
__ design.
__ supplemental.

NOTE. If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.

__ national stage of PCT.

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

__ divisional.
__ continuation.
__ continuation-in-part (C-I-P).

INVENTORSHIP IDENTIFICATION

WARNING: If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

A method for optimizing of data transmission

SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b) or (c))

(a) X is attached hereto.

(b) __ was filed on_____, as __ Serial No. 0 /_____
or __ Express Mail No., as Serial No. not yet known _____
and was amended on_____*(if applicable)*.

NOTE. Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.

(c) __ was described and claimed in PCT International Application No._____, filed on _____ and as amended under PCT Article 19 on _____ *(if any)*.

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

(also check the following items, if desired)

X and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

__ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 CFR 1.98.

PRIORITY CLAIM (35 U.S.C. § 119(a)-(d))

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) __ no such applications have been filed.

(e)X such applications have been filed as follows.

NOTE. Where item (c) is entered above and the International Application which designated the U.S itself claimed priority check item (e), enter the details below and make the priority claim.

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)

COUNTRY(OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119	
Finland	982651	8 December 1998	XYES	NO___
			__YES	NO__
			__YES	NO__
			__YES	NO__
			__YES	NO__

CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S) (34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER	FILING DATE
_____/_____	_____
_____/_____	_____
_____/_____	_____

CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S) UNDER 35 U.S.C. 120

— The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN PART (C-I-P) APPLICATION.

ALL FOREIGN APPLICATION(S), *IF ANY*, FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

_____

_____

_____

NOTE. If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

POWER OF ATTORNEY

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

Clarence A. Green (24,622)
Harry F. Smith (32,493)
Mark F. Harrington (31,686)

(check the following item, if applicable)

__ Attached, as part of this declaration and power of attorney, is the authorization of the above-named attorney(s) to accept and follow instructions from my representative(s).

SEND CORRESPONDENCE TO DIRECT TELEPHONE CALLS TO:
(Name and telephone number)
Clarence A. Green Clarence A. Green
Perman & Green 203-259-1800
425 Post Road
Fairfield, Ct 06430

11/11 '99 TO 16:01 FAX +358105056847 NMP PATENT TAMPERE 008

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

Full name of sole or first inventor:
Given name: Jussi
Middle initial or name:
Family (or last name): RUUTU

Inventor's signature: Jussi Ruutu
Date: 25.11.1999
Country of Citizenship: Finland
Residence: ~~Uudenkaupungintie 5 B 14, FIN 00350 HELSINKI, Finland~~ PELANSUU 2 B4, FIN-02210 ESPOO, FINLAND
Post Office Address: ~~Uudenkaupungintie 5 B 14, FIN-00350 HELSINKI, Finland~~

Full name of second joint inventor, if any:
Given name: Jian
Middle initial or name:
Family (or last name): MA

Inventor's signature: x)
Date: 25.11.1999
Country of Citizenship: Finland
Residence: Pihlajamarjantie 13-15 C 1, FIN-02940 ESPOO, Finland
Post Office Address: Pihlajamarjantie 13-15 C 1, FIN-02940 ESPOO, Finland

Full name of third joint inventor, if any:
Given name:
Middle initial or name:
Family (or last name):
Inventor's signature:
Date:
Country of Citizenship:
Residence:
Post Office Address:

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(check proper box(es) for any of the following added page(s) that form a part of this declaration)

__ **Signature** for fourth and subsequent joint inventors. *Number of pages added* _____.

* * *

__ **Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. *Number of pages added* _____.

* * *

__ **Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. *Number of pages added* _____.

* * *

__ Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

* * *

__ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

__ Number of pages added_____

* * *

__ Authorization of attorney(s) to accept and follow instructions from representative.

* * *

(if no further pages form a part of this Declaration, then end this Declaration with this page and check the following item)

X This declaration ends with this page.

010 NMP PATENT TAMPERE 11/11 99 10 16:02 FAX +358105056947